

# Archaeological Newsletter

The Committee for Field Archaeology



Series IV, No. 3, May 2008

## Who Owns the Cave? - Zhoukoudian Cave Revisited.

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It's not an exaggeration to say that Zhoukoudian (Chou-Kou-Tien), China's first UNESCO World Heritage site, is known to every student of archaeology. About 80 years ago, the discovery of the first skull of *Sinanthropus pekinensis*, *Peking Man* (now classified as *Homo erectus pekinensis*), affirmed the existence of *Homo erectus* in human evolution. With abundant cultural remains, Zhoukoudian is still an important Lower Palaeolithic site, revealing Middle Pleistocene hominid behaviours in East Asia. Using new analytic approaches, Zhoukoudian has been re-studied and re-evaluated in terms of cave occupation, fire use, and hominid activities. Our study here presents a functional analysis of stone tools from the *Peking Man* site.

### Davidson Black and Early Study

Zhoukoudian is located on Dragon Hill about 48 km southwest of Beijing. This limestone cave is about 140 m long from east to west and 40 m wide at its maximum (Fig. 1). Systematic excavations started in 1927 and continued until the outbreak of the Sino-Japanese War in



Figure 1: Main profile of Zhoukoudian.

1937. One of the international team leaders, Davidson Black (1884 – 1934), graduated from the University of Toronto in 1911, and went to



**Figure 2: Casts of *H. erectus pekinensis*.**

teach at Peking Union Medical College. In his spare time he pursued his passion for palaeoanthropological research. Black studied Zhoukoudian hominid fossils and made scientific casts of *Peking Man* skulls (Fig.2) that became very valuable after the originals were lost in WWII. Previously, Black and his international colleagues published a number of reports on the findings suggesting that the cave site could have been a long term home base for *Peking Man*, who was capable of making stone tools, hunting, and controlling fire in the Middle Pleistocene (780,000 – 120,000 years ago).

### **Debates on Zhoukoudian Hominid Behaviour**

After the Revolution of 1949, China shut the door of academic research to western countries. No foreign researchers had access to Zhoukoudian's collections until the mid-1980s when international research on the cave resumed. With new palaeoanthropological research techniques, a series of questions about hominid behaviours at the cave site were put forward. Lewis Binford, an iconic anthropological archaeologist, was among the first who were allowed to see some of the collections in Beijing. He suggested the deposition of fossil remains was likely just the result of carnivore activity (Binford and Ho 1985; Binford and Stone 1986). Later, other studies refuted early

reported evidence of fire-use at the cave and proposed that the fire-ash and burned bones probably were the result of natural processes. A recent study on spatial distribution of hominid fossils further dismissed the idea that the cave was a home base for *Peking Man*. Instead, it was more likely used by carnivores scavenging *Peking Man*.

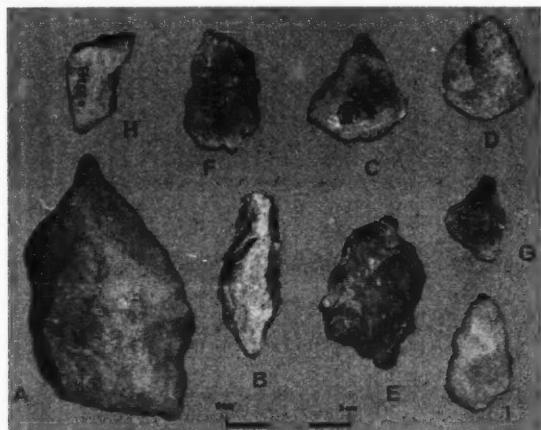
These new studies challenged old evidence, and made us rethink the nature of the cave. Now the question is: were *Peking Man* hominids hunters or the hunted? Or, who owned the cave? The last twenty years of studies in favour of carnivore activity over hominids were all based on analyses of limited samples of fauna and sediment; there were no studies on stone tools that would provide more direct and reliable evidence of hominid activity. What we needed to know was whether there was *in-situ* tool making and use in the cave. We needed also to know what kinds of "typed," as opposed to improvised, tools they purposefully made. What were these tools made for, and especially how were they used? Clearly, in order for us to understand hominid activities at Zhoukoudian, a functional study was urgently needed.

### **New Functional Study of Stone Tools**

For this ongoing study, we are very fortunate to have an official permit from the Chinese Academy of Sciences which allows us to bring samples of Zhoukoudian lithic artifacts on loan to the Royal Ontario Museum. This is the first time since 1949 that these renowned materials are outside China for collaborative research, and it is symbolic and satisfying that this destination was also the home of Davidson Black.

We chose samples from the 17,091 pieces recovered from all excavations before 1966, and previously comprehensively analyzed by Pei and Zhang (1985) for typological-technological attributes. The samples are from the Upper

Layers (1 – 5) of the cave dated to between 400 – 200 thousand years ago (**Fig.3**).



**Figure 3: Lithics showing use-wear from Upper Layers 1 - 5.**

We selected 49 pointed tools, which were finely made, for microscopic use-wear analysis. Pei and Zhang defined these as “those which have two adjacent edges chipped into one pointed edge and might have been used for piercing and cutting purposes” (1985:270). Our use-wear analysis is to examine the edge damage caused by intentional use, based on combinations and configurations of microfracture scars, rounding, and polish on the working edges. Our assessments of lithic use-wear are vigorously based on a series of relevant experimental replications.

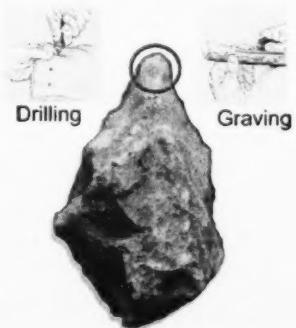
The results show that 32 out of 49 points exhibit use-wear, 9 of which have more than one functional unit of use. This clearly indicates that pointed tools have a relatively high use-rate.

Tool motion analysis showed that the primary uses of these points were clearly graving (13) and drilling (12) by using the tips. Two points were found to be used for both drilling and graving.

When we looked closely for use-wear on retouched edges adjacent to the tip, we found that 8 units were used for scraping and 3 units for cutting. Ten functional units have features related to hand-held pressure and/or hafting wear. Six pointed tools show intentionally retouched edges at the butt end, associated with clear rounding and scars that were caused from contact with medium to hard materials like bone or hardwood.

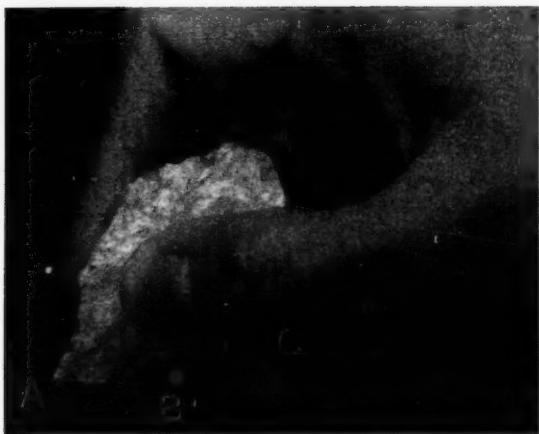
At present, it is still difficult to determine the exact materials worked. More than 17 functional units can be positively assessed to have been used on relatively hard animal substances, like fresh or dry bones, while 4 seem to be associated with soft animal substances.

For example, specimen P2259 displays use-wear evidence suggesting pointed tools had multiple uses. Here the tip was used for both drilling and graving. The drilling caused this tip to possess a majority of scars with stepped termination on one working edge, and scars with feathered and hinged terminations on the other side, indicating a dual rotation of drilling with different forces (**Fig.4**).



**Figure 4: Use of Point P2259.** with stepped termination on one working edge, and scars with feathered and hinged terminations on the other side, indicating a dual rotation of drilling with different forces (**Fig.4**).

More interestingly, 9 points show use-wear indicating both the tip and retouched side edge were used together for multiple tasks. For example, pointed tool P3577 (**Fig.5**) illustrates such a combination of a multiple-use pointed tool with functions of a drilling tip (A) and a scraping edge near the tip (B). An important use-wear element observed on this point is the



**Figure 5: Multiple use-wear of Point P3577.**

hand-held wear damage (C) that resulted from the pressure of a middle finger against the tool when the piece was held for drilling and scraping activities.

### **Who Owns the Cave?**

This study provides new evidence for *Peking Man* stone tool utilization. The use-wear data clearly support the notion put forth by Pei and Zhang's study that morphologically typed points were made for special functions.

Our present study, of course, is based on only one category of tool type – pointed tools, but the results of use-wear analysis suggest that *Peking Man* was purposefully making and using pointed tools *in-situ*, at least during the Late Phase of the occupation. The available data so far imply that the tools were mostly used on animal substances, clearly suggesting that *Peking Man* had close interaction with the local wildlife at the time the cave was occupied, but that does not necessarily mean that their subsistence relied heavily on animal resources.

Based on this preliminary study, we can hypothesize that *Peking Man* hominids were

capable of producing distinctive tool forms for different tasks. Hominid tool-use behaviours at Zhoukoudian clearly suggest that occasionally, when *Peking Man* got the upper hand in battles for survival with predatory carnivores, the early hominids might have occupied the cave as their home base for a variety of on-site activities, although these may have been short-lived. They owned the cave temporarily and left us with the traces of their partial life at Zhoukoudian.

### **Acknowledgements**

This project is generously supported by the Institute of Vertebrate Paleontology and Palaeoanthropology, Chinese Academy of Science; Royal Ontario Museum Governor Peer-Review Grant, Chinese Academy of Sciences' Outstanding Oversea-Chinese Scholar Fellowship, and the Fellowship from the Luce/ACLS initiative on East and Southeast Asian Archaeology and Early History.

### **Further Reading**

Binford, Lewis R., and Chuan Kun Ho  
1985 Taphonomy at a Distance: Zhoukoudian, "The Cave Home of Beijing Man"? *Current Anthropology* 26: 413-429.

Binford, Lewis R., and Nancy M. Stone  
1986 Zhoukoudian: A Closer Look. *Current Anthropology* 27: 453-468.

Jia, Lanpo, and Weiwen Huang  
1990 *The Story of Peking Man: From Archaeology to Mystery*. Oxford University Press.

Pei, Wenzhong, and Senshui Zhang  
1985 A study of the lithic artifacts of *Sinanthropus*. *Palaeontological Sinica New Series D No.12*. Science Press, Beijing.

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